COMPSCI 210 Assignment 1 Marking Guide

- Name the marking sheet with the student's UPI.
- The students only need to give the answer to each question. They do NOT need to show their working.
- In the feedback column on the marking sheet, give some reasons regarding the marks gained by the student in the corresponding question, e.g. "correct", "overflow is not indicated", etc.
- You can give partial mark for a question.

1. Convert the following unsigned decimal number to an 8-bit unsigned binary number.
   121_{10}
   $121_{10} = 01111001_2$ [5 marks]

2. Convert the following 8-bit unsigned binary number to an unsigned decimal number.
   11111001_2
   $11111001_2 = 249_{10}$ [5 marks]

3. What is the range of a 4-bit unsigned binary number?
   [0 .. 15] [5 marks]

4. Convert the following decimal number to an 8-bit signed magnitude binary number.
   -21_{10}
   $-21_{10} = 10010101_2$ [5 marks]

5. Convert the following 8-bit signed magnitude binary number to a decimal number.
   10001110_2
   $10001110_2 = -14_{10}$ [5 marks]

6. Convert the following decimal number to an 8-bit one's complement binary number.
   15_{10}
   $15_{10} = 00001111_2$ [5 marks]

7. Convert the following 8-bit one's complement binary number to a decimal number.
   11110101_2
   $11110101_2 = -10_{10}$ [5 marks]

8. Convert the following decimal number to an 8-bit two's complement binary number.
   -12_{10}
   $-12_{10} = 11110100_2$ [5 marks]

9. Convert the following 8-bit two's complement binary number to a decimal number.
   11111101_2
   $11111101_2 = -3_{10}$ [5 marks]

10. Assume the following numbers are two's complement binary numbers. Signe extend the following numbers to make them into 8-bit two's complement binary numbers.
    0111_2 1010_2
    $0111_2 = 00000111_2$ [2.5 marks]
    $1010_2 = 11111010_2$ [2.5 marks]

11. Assume the following numbers are 8-bit two's complement binary numbers. Calculate the result of each of the expressions. If there is an overflow during the operation, you need to indicate the overflow.
    10000001 + 00010001
    10000000 - 00000001
    10000001 + 00010001 = 10010010 [5 marks]
    10000000 - 00000001 = 10000000 + (-00000001) = 10000000 + 11111111 = 01111111 (overflow since the sign of the result is different from the two numbers being added) [5 marks]

12. What is the result of the bit-wise AND operation of 00111100 and 01010101?
    00111100 & 01010101 = 00010100 [5 marks]

13. What is the result of the bit-wise OR operation of 00011100 and 01010101?
    00011100 | 01010101 = 01011101 [5 marks]

14. What is the result of 00001101 << 3?
    00001101 << 3 = 01101000 [5 marks]

15. What is the result of 10100000 >> 3?
    10100000 >> 3 = 11110100 [5 marks]

16. What is the hexadecimal representation of 1111011100011000_2?
    $1111011100011000_2 = 0xF718$ [5 marks]

17. Convert 0x1AE6 to a binary number.
    $0x1AE6 = 0001101011100110_2$ [5 marks]

18. What is the octal representation of 111101110001100_2?
    $111101110001100_2 = 75614_8$ [5 marks]

19. Convert 123_8 to a binary number.

    $123_8 = 001010011_2$ [5 marks]